

Name _____

AP Chemistry

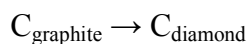
Hess's Law & Standard Enthalpies

Hess's Law

Hess's law states that enthalpy change, in going from a particular set of reactants to a particular set of products, is the same whether the reaction takes place in one step or in a series of steps.

Example #1:

Two forms of carbon are graphite, the soft, black, slippery material used in "lead" pencils and as a lubricant for locks, and diamond, the brilliant, hard gemstone. Using the enthalpies of combustion for graphite (-394 kJ/mol) and diamond (-396 kJ/mol), calculate ΔH for the conversion of graphite to diamond:

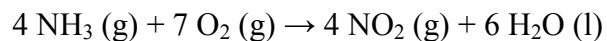


Standard Enthalpy

The standard enthalpy of formation of a compound is the change in enthalpy that accompanies the formation of one mole of a compound from its elements with all substances in their standard states. The degree symbol on ΔH° indicates that the process occurred under standard conditions of 25°C, 1 atm and 1 M solutions. By definition, the standard heat of formation for elements in their standard states equals zero. To calculate the enthalpy change for a given reaction, the enthalpies of formation of the reactants are subtracted from the enthalpies of formation of the products:

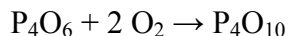
Example #2:

Using the standard enthalpies of formation, calculate the standard enthalpy change for the overall reaction that occurs when ammonia is burned in air to form nitrogen dioxide and water. This first step in the manufacture of nitric acid:

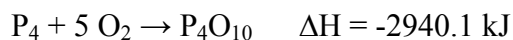


Questions

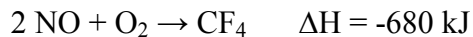
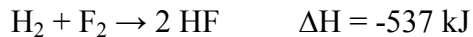
- 1) Calculate the enthalpy change for the reaction



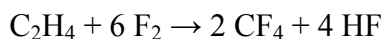
given the following enthalpies of reaction:



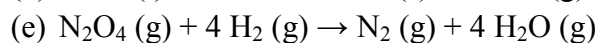
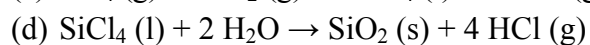
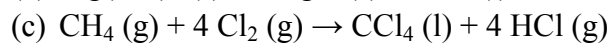
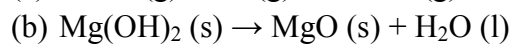
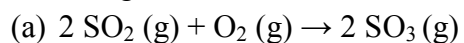
- 2) From the enthalpies of reaction



calculate ΔH for the reaction of ethylene with F_2 :



3) Using the standard enthalpies, calculate the standard enthalpy change for each of the following reactions:



4) Calculate the standard enthalpy of formation of solid $\text{Mg}(\text{OH})_2$, given the following data:

